Comparison of Buccal Infiltration of 4% Articaine With 1 : 100,000 and 1 : 200,000 Epinephrine for Extraction of Maxillary Third Molars With Pericoronitis: A Pilot Study

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We compared the buccal infiltration of 4% articaine with 1 : 100,000 or 1 : 200,000 epinephrine without a palatal injection for the extraction of impacted maxillary third molars with chronic pericoronitis. This prospective, double-blind, controlled clinical trial involved 30 patients between the ages of 15 and 46 years who desired extraction of a partially impacted upper third molar with pericoronitis. Group 1 (15 patients) received 4% articaine with 1 : 100,000 epinephrine and group 2 (15 patients) received 4% articaine with 1 : 200,000 epinephrine by buccal infiltration. None of the patients in group 1 reported pain, but 3 patients in group 2 reported pain, which indicated a need for a supplementary palatal injection. The palatal injections were all successful in eliminating the pain. Two additional patients in group 2 experienced pain when the suture needle penetrated their palatal mucosa. Based on these results, 4% articaine with 1 : 100,000 epinephrine was found to be more effective for the removal of upper third molars in the presence of pericoronitis than 4% articaine hydrochloride with 1 : 200,000 epinephrine when only a buccal infiltration was used.

Key Words: Articaine; Epinephrine; Molar extraction.

Maxillary third molar extraction is generally straightforward, due to the plasticity of the maxillary bone and to the low resistance to extraction movements.

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Nevertheless, the anesthetic technique needed for such extraction may be extremely uncomfortable because it requires palatal mucosal anesthesia.^{1,2}

Studies have suggested that articaine has good diffusion through the hard and soft tissues, eliminating the need for the palatal injection in maxillary third molar extractions.^{3–6} However, the anesthetic effect may be decreased or neutralized because the inflammation and

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low tissue pH affects tissue diffusion of the anesthetic, making the drug less effective.^{7–9}

Pericoronitis is the most frequent inflammatory pathology associated with third molars and is caused by a combination of factors including trauma and food impaction with subsequent bacterial colonization and infection.^{1,10–13} Clinically, it is characterized by the presence of erythema, swelling, and even ulceration in some cases.^{1,14} The management of pericoronitis varies. Many authors have recommended using antibiotic therapy when there are signs of acute infection with systemic involvement such as fever. In cases of chronic or nonacute clinical manifestations, treatment should be limited to antiseptic mouthwashes, irrigation, and anti-inflammatory and/or anesthetic medication. Surgically, the usual treatment is the extraction of the impacted tooth.^{1,11–15}

The aim of the present study was to evaluate the differences between articaine hydrochloride with 1 : 100,000 and 1 : 200,000 epinephrine (adrenaline) administered by buccal infiltration alone (without palatal infiltration) for the removal of impacted upper third molar teeth with pericoronitis.

METHODS

The research protocol was approved by the Ethics Committee at the State Health Department, João Pessoa, PB, Brazil (13/2005). All patients signed the consent form to participate of the study.

This was a prospective, double-blind, daily pay, experimental research study comprising primary data. Thirty patients aged between 15 and 46 years who had pericoronitis affecting one of their upper third molars that was indicated for extraction were selected. They were divided into 2 groups of 15, and each patient in each group received only buccal infiltrations without palatal anesthesia.

In group 1, 1.8 mL of 4% articaine hydrochloride with 1 : 100,000 epinephrine (Articaine, DFL, Rio de Janeiro, Brazil) was used. Group 2 received 1.8 mL of 4% articaine hydrochloride with 1 : 200,000 epinephrine (Septanest, Septodont, São Paulo, Brazil).

All surgical procedures were performed by a single surgeon (blinded), who began the procedure by administering the local anesthetic in the buccal region adjacent to the maxillary third molars. After a 5-minute period, the surgical procedure for tooth removal was initiated. Neither systemic sedation nor general anesthesia was performed, and patients remained conscious and oriented throughout the procedure and were able to communicate with the surgeon. All extractions needed a

mucoperiosteal flap and tooth elevation, and sutures.^{5,6,15}

Anesthesia adequacy was determined at each surgical phase according to presence or absence of pain as indicated by the patient in agreement with a preestablished protocol. After each surgical step, the surgeon questioned the patient regarding pain intensity. The patient replied using previously agreed hand gestures; if feeling pain, the patient would raise his/her left hand meaning “STOP” or if not feeling pain, the left hand should show the forefinger with the other fingers down and produce a pendulum movement indicating “NO.” When the answer was negative, the surgery proceeded until the end. However, when pain was detected, a palatal infiltration was administered in order to complete the surgical procedure.⁶

Significant differences between experimental groups were investigated by chi-square tests and residual analysis with significance level of $P \leq .05$. Data analysis was carried out on GraphPad Prism software (GraphPad Software, San Diego, Calif).

RESULTS

Buccal-palatal diffusion of 4% articaine hydrochloride with epinephrine at 2 different concentrations (1 : 100,000 and 1 : 200,000) was compared. Success rate was determined by the number of extractions performed without the need for supplemental palatal injections. In group 1, none of the patients who underwent extractions using 4% articaine hydrochloride with 1 : 100,000 epinephrine reported pain, which indicates such a formulation was 100% effective. In group 2, from the total of patients undergoing extractions using 4% articaine hydrochloride with 1 : 200,000 epinephrine, 3 (20%) reported pain during luxation, thus indicating a need for supplementary palatal injection. The effectiveness in this group was 80%. In cases when palatal injection was necessary, it was always successful in stopping the pain.

After analyses and sensitivity comparisons, significant differences were observed between both groups 1 and 2 ($\chi^2 = 3.84$, $P = .0143$) (Table).

DISCUSSION

Upper third molars are commonly available as models to analyze the efficacy of local anesthetic formulations. This pilot study was a prospective clinical trial using upper third molars affected by pericoronitis as a surgical dental model to investigate different articaine/epinephrine formulations by means of only buccal anesthesia without palatal injection.

Prevalence of Patients With Pericoronitis, Epinephrine Concentration, and Pain Sensation During Surgical Procedure*

Groups	Number	Pain Sensation During Surgical Procedure	Frequency	Supplementary Palatal Anesthesia Required to Complete the Surgical Procedure	Percent
1, 1 : 100,000	15	No pain	15	No	100
2, 1 : 200,000	15	No pain	10	No	66.67
		Luxation	3	Yes	20
		Suture	2	No	13.33

* $n = 30$, $\chi^2 = 3.84$, $P = .0143$.

The small sample in our research is in agreement with the scarce prevalence of trials comprising pericoronitis in that anatomic location.^{5,6,10}

Despite the possibility of lack of anesthetic efficacy due to decreased conversion of articaine to the lipid-soluble form of the local anesthetic, information on periodontal inflammatory pathology in impacted third molars with pericoronitis is limited mostly due to lack of clinical data collection in acidic environment of pericoronitis.^{3,5,8} However, articaine was shown to be effective in most of cases, and articaine with 1 : 100,000 epinephrine being effective in all cases.

The results of this pilot study showed that, in most cases, articaine diffused successfully with no need for palatal anesthesia. Corroborating with our findings, most other studies have suggested that articaine diffuses well through soft and hard tissues.^{4–6,16,17}

In 2 cases from group 2, there were reports of pain during suturing, exactly when the suture needle was crossing palatal mucosa, but as it was just at one single point, no patient required supplementary palatal anesthesia because a palatal anesthetic injection could potentially be more painful than the suture needle crossing at a single point.

The results suggest that vasoconstrictor concentration influenced the effectiveness of the anesthetic, possibly because the more intense vasoconstriction of the 1 : 100,000 concentration increased the amount of the articaine available to the palatal soft tissue. Moore et al¹⁹ pointed out that 4% articaine with 1 : 100,000 epinephrine had the additional therapeutic advantage of providing better visualization of the surgical field and less bleeding. On the other hand, Santos et al²⁰ concluded that epinephrine concentration at 1 : 100,000 or 1 : 200,000 in a 4% articaine solution did not affect the clinical efficacy of this local anesthetic for lower third molar extraction with or without bone removal.

CONCLUSIONS

Based on the present results, 4% articaine hydrochloride with 1 : 100,000 epinephrine was found to be

more effective for the removal of maxillary third molars in the presence of pericoronitis than 4% articaine hydrochloride with 1 : 200,000 epinephrine when no palatal anesthetic injection was administered. Attention should be drawn to data analysis due to the subjectivity of the pain measurement method used, the absence of a “gold standard” for comparison, and the small sample size.

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